Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.58 Printed on 29 November 2022 at 15:07:32

Proiect Information:

Assessed By: Liam Mason (STRO033679) Building Type: Semi-detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 72.5m²

Site Reference: Bell Road, Bottisham

Plot Reference: Plot 34

Address: Plot 34

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.69 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 8.50 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 49.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 45.2 kWh/m²

OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.19 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.36 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Database: (rev 508, product index 016841):

Boiler systems with radiators or underfloor heating - mains gas

Brand name: Vaillant Model: ecoTEC plus 824

Model qualifier: VUW GB 246/5-5

(Combi)

Efficiency 89.1 % SEDBUK2009

Minimum 88.0 % OK

Secondary heating system: None

Regulations Compliance Report

Cylinder insulation			
Hot water Storage:	No cylinder		
Controls			
Space heating controls	Programmer, room thermo	stat and TRVs	OH
Hot water controls:	No cylinder thermostat		
	No cylinder		
Boiler interlock:	Yes		Ok
Low energy lights			
Percentage of fixed lights with lo	ow-energy fittings	100.0%	
Minimum		75.0%	OF
Mechanical ventilation			
Not applicable			
Summertime temperature			
Overheating risk (East Anglia):		Medium	OF
sed on:			
Overshading:		Average or unknown	
Windows facing: West		1.17m²	
Windows facing: West		1.12m²	
Windows facing: North		0.39m²	
Windows facing: East		2.98m²	
Windows facing: North		0.39m²	
Windows facing: East		1.14m²	
Windows facing: East		1.25m²	
Ventilation rate:		3.00	r blind
Blinds/curtains:		Dark-coloured curtain or rolle	טוווט וי

Closed 100% of daylight hours

Roofs U-value 0.11 W/m²K
Party Walls U-value 0 W/m²K
Floors U-value 0.11 W/m²K

Photovoltaic array

Predicted Energy Assessment



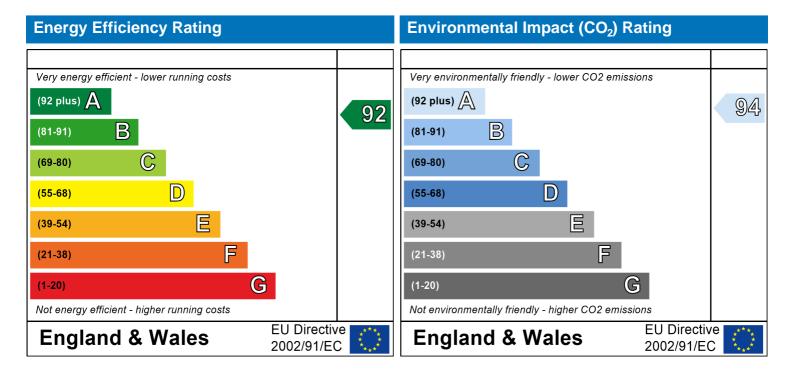
Plot 34

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Semi-detached House 03 November 2022 Liam Mason 72.5 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP Input

Property Details: Plot 34

Address: Plot 34
Located in: England
Region: East Anglia

UPRN:

Date of assessment:

Date of certificate:

Assessment type:

03 November 2022
29 November 2022
New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown

No related party
Indicative Value Low

Water use <= 125 litres/person/day: True

PCDF Version: 508

Property description:

Dwelling type: House

Detachment: Semi-detached

Year Completed: 2022

Floor Location: Floor area:

Floor 0 36.25 m^2 2.4 m Floor 1 36.25 m^2 2.4 m

Living area: 12.61 m² (fraction 0.174)

Front of dwelling faces: West

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W_7

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D_1	Manufacturer	Solid			
W_1	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	Yes	
W_2	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	Yes	
W_3	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	Yes	
W_4	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	Yes	
W_5	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	Yes	
W_6	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	Yes	
W_7	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	Yes	

Storey height:

1.4

1.25

1

Name:	Gap:	Frame F	actor: g-value:	U-value:	Area:	No. of Openings:
D_1	mm	0	0	1.2	1.83	1
W_1	16mm or more	0.7	0.63	1.4	1.17	1
W_2	16mm or more	0.7	0.63	1.4	1.12	1
W_3	16mm or more	0.7	0.63	1.4	0.39	1
W_4	16mm or more	0.7	0.63	1.4	2.98	1
W_5	16mm or more	0.7	0.63	1.4	0.39	1
W_6	16mm or more	0.7	0.63	1.4	1.14	1

0.63

0.7

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D_1	Doors	Wall 1	West	1.83	1
W_1	Windows	Wall 1	West	1.17	1
W_2	Windows	Wall 1	West	1.12	1
W_3	Windows	Wall 1	North	0.39	1
W_4	Windows	Wall 1	East	2.98	1
W_5	Windows	Wall 1	North	0.39	1
W_6	Windows	Wall 1	East	1.14	1
W_7	Windows	Wall 1	East	1.25	1

16mm or more

SAP Input

Overshading: Average or unknown

Opaque Liement	5.						
Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:
External Elemen		10.07	70.75	0.40	•	- I	21/2
Wall 1	84.02	10.27	73.75	0.19	0	False	N/A
Roof 1	36.25	0	36.25	0.11	0		N/A
Floor 1	36.25			0.11			N/A
Internal Element	<u>ts</u>						
INT FLOOR	36.25						N/A
Party Elements							
Party Wall	39.42						N/A

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0885

Lanath	Doi volue	• • • • • • • • • • • • • • • • • • • •	
Length	Psi-value		0 16 ()
17.06	0.16	E5	Ground floor (normal)
17.06	0.07	E6	Intermediate floor within a dwelling
9.85	0.09	E16	Corner (normal)
8	0.3	E2	Other lintels (including other steel lintels)
7.07	0.04	E3	Sill
17.4	0.05	E4	Jamb
9.06	0.06	E10	Eaves (insulation at ceiling level)
11.29	0.24	E12	Gable (insulation at ceiling level)
9.85	0.06	E18	Party wall between dwellings
0	0.3	E2	
0	0.04	E3	
0	0.05	E4	
0	0.16	E5	
0	0.07	E6	
0	0.06	E10	
0	0.24	E12	
0	0.09	E16	
0	-0.09	E17	
0	0.06	E18	
8	0.16	P1	Ground floor
8	0	P2	Intermediate floor within a dwelling
0	0.16	P1	
0	0	P2	
4.53	0.08	R4	Ridge (vaulted ceiling)
0	0.08	R4	

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Natural ventilation (extract fans)

Number of chimneys: 0
Number of open flues: 0
Number of fans: 2
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 5

Main heating system:

Main heating system: Boiler systems with radiators or underfloor heating

Gas boilers and oil boilers

Fuel: mains gas

Info Source: Boiler Database

SAP Input

Database: (rev 508, product index 016841) Efficiency: Winter 87.0 % Summer: 90.0

Brand name: Vaillant Model: ecoTEC plus 824

Model qualifier: VUW GB 246/5-5

(Combi boiler)

Systems with radiators

Central heating pump: 2013 or later

Design flow temperature: Design flow temperature<=45°C

Unknown

Boiler interlock: Yes Delayed start

Main heating Control:

Main heating Control: Programmer, room thermostat and TRVs

Control code: 2106

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False

Others:

Electricity tariff: Standard Tariff
In Smoke Control Area: Unknown
Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

EPC language: English Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 2 Tilt of collector: 45°

Overshading: None or very little Collector Orientation: East

Assess Zero Carbon Home: No

		User Details:				
Assessor Name:	Liam Mason	Stroma I	lumbor:	STRO	033679	
Software Name:	Stroma FSAP 2012		Version:		n: 1.0.5.58	
		Property Address: Pl				
Address :	Plot 34	,				
1. Overall dwelling dime	ensions:					
		Area(m²)	Av. Heigh	t(m)	Volume(m ³	³)
Ground floor		36.25 (1a) x 2.4	(2a) =	87	(3a)
First floor		36.25 (1b) x 2.4	(2b) =	87	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	(1n) 72.5 (4)				
Dwelling volume		(3)	a)+(3b)+(3c)+(3d)+(3	Be)+(3n) =	174	(5)
2. Ventilation rate:						
	main second heating heatin		total		m³ per hou	ır
Number of chimneys	0 + 0	+ 0	= 0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	= 0	x 20 =	0	(6b)
Number of intermittent fa	ns		2	x 10 =	20	(7a)
Number of passive vents			0	x 10 =	0	(7b)
Number of flueless gas fi	res		0	x 40 =	0	(7c)
					anges per he	
Infiltration due to obimpo	us fluor and fano (62) (6b)) (/7a) (/7b) (/7a) =		٠, ,	anges per ho	
•	ys, flues and fans = $(6a)+(6b)$ neen carried out or is intended, produced		20 inue from (9) to (16)	÷ (5) =	0.11	(8)
Number of storeys in the		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(3) (3)		0	(9)
Additional infiltration				[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame	or 0.35 for masonry of	onstruction		0	(11)
if both types of wall are po deducting areas of openion	resent, use the value corresponding	g to the greater wall area (a	fter			
=	floor, enter 0.2 (unsealed) o	r 0.1 (sealed), else en	ter 0		0	(12)
If no draught lobby, en	ter 0.05, else enter 0				0	(13)
Percentage of windows	s and doors draught stripped	d			0	(14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =		0	(15)
Infiltration rate		(8) + (10) + (1	1) + (12) + (13) + (15	5) =	0	(16)
Air permeability value,	q50, expressed in cubic me	etres per hour per squa	are metre of enve	elope area	5	(17)
•	ity value, then $(18) = [(17) \div 20]$				0.36	(18)
	es if a pressurisation test has been	done or a degree air perme	ability is being used	ſ		_
Number of sides sheltere Shelter factor	ed	(20) = 1 - [0.0	75 x (19)] =		2	(19)
Infiltration rate incorporat	ing shelter factor	$(20) = 1 \cdot (0.00)$ $(21) = (18) \times (0.00)$	· /-	[[0.85	(20)
Infiltration rate modified f	•	(=·) = (·•) * (-1		0.31	(21)
Jan Feb	Mar Apr May Jui	n Jul Aug	Sep Oct	Nov Dec		
l l	1 ' 1 ' 1	ii j oui j Aug j	och Oct	THOY DEC		
Monthly average wind sp	eed Irom Table /					

4.9

4.4

4.3

3.8

3.8

3.7

4

4.3

4.5

4.7

(22)m=

Wind Factor (2	22a)m =	(22)m ∸	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjusted infiltr	ation rate	e (allowi	na for sh	nelter an	d wind s	:need) -	(21a) y	(22a)m	!		!	•	
0.4	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36]	
Calculate effe		_	rate for t	he appli	cable ca	se	<u> </u>	<u> </u>	<u> </u>		<u> </u>	J	
If mechanica			andis N. (O	2h) (22a	.) (4	accetion (N	\ F\\	muiaa (22h	·) (22a)			0	(23a)
If exhaust air h)) = (23a)			0	(23b)
		-	-	_					Oh)m ı ((22h) [1 (22a)	0	(23c)
a) If balance (24a)m= 0	o mecha	o o	ntilation	with nea	at recove		$\frac{HR}{0}$ (248	$\frac{a)m = (2a)}{a}$	26)m + (0	$\frac{(230) \times [}{0}$	$\frac{1 - (230)}{0}$	1 ÷ 100]	(24a)
b) If balance		_										J	(244)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole h		,	,	,	<u> </u>							J	(= :)
,	n < 0.5 x			•	•				.5 × (23k	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural if (22b)n	ventilation								0.5]	•	•	•	
(24d)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(24d)
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in bo	x (25)				•	
(25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)
3. Heat losse	s and he	at loss p	paramete	er:									
ELEMENT	Gros	·	Openin		NIat A.								
	area	_	m	-	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·l		A X k kJ/K
Doors		_	•	-		m²				K)			
Doors Windows Type	area	_	•	-	A ,r	m² x	W/m2	2K =	(W/	K)			kJ/K
	area	_	•	-	A ,r	m ² x x 1.	W/m2	2K = - 0.04] =	(W/ 2.196	K)			kJ/K (26)
Windows Type	area e 1 e 2	_	•	-	A ,r	m ² x x10 x10	W/m2 1.2 /[1/(1.4)+	2K = 0.04 = 0.04 =	(W/ 2.196 1.55	K)			kJ/K (26) (27)
Windows Type	area	_	•	-	A ,r 1.83 1.17	x1. x1. x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+	= 0.04 $=$ 0.04 $=$ 0.04 $=$ 0.04 $=$	(W/ 2.196 1.55 1.48	K)			kJ/K (26) (27) (27)
Windows Type Windows Type Windows Type	area	_	•	-	A ,r 1.83 1.17 1.12 0.39	x1. x1. x1. x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{ccc} 2K & & & & \\ \hline & & & & \\ \hline & & & & \\ \hline & & & &$	(W/ 2.196 1.55 1.48 0.52	K)			kJ/K (26) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	area	_	•	-	A ,r 1.83 1.17 1.12 0.39 2.98	x1. x1. x1. x1. x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	EK = - 0.04] =	(W/ 2.196 1.55 1.48 0.52 3.95	K)			kJ/K (26) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	area 1 2 3 4 4 5 6 6	_	•	-	A ,r 1.83 1.17 1.12 0.39 2.98 0.39	x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	EK = 0.04 =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52	K)			kJ/K (26) (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type	area 1 2 3 4 4 5 6 6	_	•	-	A ,r 1.83 1.17 1.12 0.39 2.98 0.39 1.14	x1. x1. x1. x1. x1. x1. x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	EK = 0.04 =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51	K) 			kJ/K (26) (27) (27) (27) (27) (27)
Windows Type	area 1 2 3 4 4 5 6 6	(m²)	•	2	A ,r 1.83 1.17 1.12 0.39 2.98 0.39 1.14 1.25	x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	EK = 0.04] = 0	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66	K) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor	area 1 2 2 3 4 4 5 5 6 6 7	(m²)	m	2	A ,r 1.83 1.17 1.12 0.39 2.98 0.39 1.14 1.25 36.28	x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	EK = 0.04 =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875	K) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (28)
Windows Type	area area 1 2 3 4 5 6 7 84.0 36.2	(m²) 2 5	10.22	2	A ,r 1.83 1.17 1.12 0.39 2.98 0.39 1.14 1.25 36.25 73.75 36.25	x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.19	EK = 0.04 =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875	K) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (28) (29)
Windows Type Roof	area area 1 2 3 4 5 6 7 84.0 36.2	(m²) 2 5	10.22	2	A ,r 1.83 1.17 1.12 0.39 2.98 0.39 1.14 1.25 36.25 73.75 156.5	x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.19 0.11	EK = 0.04 =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875 14.01 3.99	K) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (28) (29) (30) (31)
Windows Type Floor Walls Roof Total area of e	area area 1 2 3 4 5 6 7 84.0 36.2	(m²) 2 5	10.22	2	A ,r 1.83 1.17 1.12 0.39 2.98 0.39 1.14 1.25 36.25 73.75 36.25 156.5	x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.19	2K = 0.04 =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875	K) 			kJ/K (26) (27) (27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Tloor Walls Roof Total area of e Party wall	area 2 1 2 2 3 3 4 4 5 5 6 6 7 84.0 36.2 elements	(m²) 2 5 , m²	10.22	7 7 ndow U-ve	A ,r 1.83 1.17 1.12 0.39 2.98 0.39 1.14 1.25 36.25 73.75 36.25 39.42 36.25 alue calcul	x1. x1. x1. x1. x1. x1. x2. x2. x x2. x x2. x x3. x x3	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.19 0.11	EK =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875 14.01 3.99	K)	kJ/m²-l	k 	kJ/K (26) (27) (27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Tloor Walls Roof Total area of e Party wall Internal floor * for windows and	area area	(m²) 2 5 , m² ows, use e sides of in	10.23 0	7 7 ndow U-ve	A ,r 1.83 1.17 1.12 0.39 2.98 0.39 1.14 1.25 36.25 73.75 36.25 39.42 36.25 alue calcul	x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.19 0.11	2K = 0.04 =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875 14.01 3.99	K)	kJ/m²-l	k 	kJ/K (26) (27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Tloor Walls Roof Total area of e Party wall Internal floor * for windows and ** include the area	area area	(m²) 2 5 , m² ows, use e sides of in = S (A x	10.23 0	7 7 ndow U-ve	A ,r 1.83 1.17 1.12 0.39 2.98 0.39 1.14 1.25 36.25 73.75 36.25 39.42 36.25 alue calcul	x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.19 0 formula 1	2K = 0.04 =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875 14.01 3.99	K)	kJ/m²•l	K	kJ/K (26) (27) (27) (27) (27) (27) (28) (29) (30) (31) (32) (32d)
Windows Type Floor Walls Roof Total area of e Party wall Internal floor * for windows and ** include the area Fabric heat los	area area	2 5 , m² sides of in = S (A x A x k)	10.22 0	ndow U-va	A ,r 1.83 1.17 1.12 0.39 2.98 0.39 1.14 1.25 36.25 73.75 36.25 39.42 36.25 alue calculatitions	x1.	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.11 0.19 0 formula 1	2K =	(W/ 2.196 1.55 1.48 0.52 3.95 0.52 1.51 1.66 3.9875 14.01 3.99	K)	kJ/m²•l	1 3.2 35.37	kJ/K (26) (27) (27) (27) (27) (27) (28) (29) (30) (31) (32) (32d)

an be use												_		
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<i>details oi</i> otal fab			are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =		Г	49.22	(3:
			alculated	l monthly	V					` '	25)m x (5)	L	49.22	(°
Г	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m=	33.2	33.03	32.86	32.05	31.9	31.2	31.2	31.07	31.47	31.9	32.21	32.52		(3
∟ eat trai	nsfer c	oefficier	nt. W/K		ļ.	ļ.	ļ.		(39)m	= (37) + (3	38)m			
_	82.42	82.25	82.08	81.28	81.13	80.43	80.43	80.3	80.7	81.13	81.43	81.75		
_	'				ļ.	ļ.	!		,	Average =	Sum(39) ₁	12 /12=	81.27	(3
_	-		HLP), W/		ı	ı			` '	= (39)m ÷	·			
0)m=	1.14	1.13	1.13	1.12	1.12	1.11	1.11	1.11	1.11	1.12	1.12	1.13	1.10	 ,
umber	of day	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.12	(4
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if TFA nnual a educe the	£ 13.9 averago e annua hat 125	o, N = 1 e hot wa l average litres per p	ater usag hot water person per	ge in litre usage by a day (all w	es per da 5% if the d vater use, l	ay Vd,av welling is hot and co	erage = designed ld)	(25 x N) to achieve	+ 36 a water us	se target o	88			(4
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if TFA nnual a educe the at more to	£ 13.9 average e annua hat 125 Jan usage ir	e hot wa I average litres per p Feb	hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month	es per da 5% if the d vater use, l May Vd,m = fa	ay Vd,av Iwelling is thot and co Jun ctor from	erage = designed ld) Jul Table 1c x	(25 x N) to achieve Aug	+ 36 a water us Sep	ce target o	Nov	Dec		(
if TFA nnual a educe the t more to	£ 13.9 average e annua hat 125 Jan	o, N = 1 e hot wa l average litres per p	ater usag hot water person per Mar	ge in litre usage by day (all w	es per da 5% if the d vater use, l	ay Vd,av dwelling is hot and co	erage = designed ld) Jul	(25 x N) to achieve	+ 36 a water us Sep 87.17	Oct	Nov 94.29		1067.4	
if TFA nnual a educe the the more to the water of the water of	£ 13.9 average annua hat 125 Jan usage ir	e hot wa l average litres per p Feb n litres per 94.29	hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month 87.17	es per da 5% if the d vater use, I May Vd,m = fa 83.61	ay Vd,av Iwelling is that and co Jun ctor from	erage = designed Id) Jul Table 1c x 80.05	(25 x N) to achieve Aug	+ 36 a water us Sep 87.17	Oct 90.73 Fotal = Sur	Nov 94.29 m(44) ₁₁₂ =	Dec 97.84	1067.4	
if TFA nnual a educe the ot more to the thick	£ 13.9 average annua hat 125 Jan usage ir	e hot wa l average litres per p Feb n litres per 94.29	hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month 87.17	es per da 5% if the d vater use, I May Vd,m = fa 83.61	ay Vd,av Iwelling is that and co Jun ctor from	erage = designed Id) Jul Table 1c x 80.05	(25 x N) to achieve Aug (43) 83.61	+ 36 a water us Sep 87.17	Oct 90.73 Fotal = Sur	Nov 94.29 m(44) ₁₁₂ =	Dec 97.84	1067.4	
if TFA nnual a educe the ot more to twater of water 4)m= hergy con 5)m=	£ 13.9 average annua hat 125 Jan usage ir 97.84 ntent of 145.1	P, N = 1 e hot wa I average litres per p Feb n litres per 94.29 hot water 126.91	Mar 90.73 used - calc	ge in litre usage by day (all w Apr ach month 87.17 culated mo	es per da 5% if the da vater use, l May Vd,m = fa 83.61 ponthly = 4.	ay Vd,av dwelling is that and co Jun ctor from 1 80.05	erage = designed d) Jul Table 1c x 80.05	(25 x N) to achieve Aug (43) 83.61 07m / 3600 100.52	+ 36 a water us Sep 87.17 0 kWh/mon 101.72	Oct 90.73 Fotal = Surth (see Ta	94.29 m(44) ₁₁₂ = ables 1b, 1	97.84 e c, 1d)	1067.4	((
if TFA nnual a educe the ot more to twater 4)m= hergy con 5)m=	£ 13.9 average annua hat 125 Jan usage ir 97.84 ntent of 145.1	P, N = 1 e hot wa I average litres per p Feb n litres per 94.29 hot water 126.91	Mar day for ea 90.73 used - calc	ge in litre usage by day (all w Apr ach month 87.17 culated mo 114.17 of use (no	es per da 5% if the orater use, I May $Vd,m = fa$ 83.61 $conthly = 4$. $conthly = 4$.	ay Vd,av Iwelling is that and co Jun ctor from 1 80.05 190 x Vd,r 94.53	erage = designed d) Jul Table 1c x 80.05 m x nm x L 87.6 enter 0 in	(25 x N) to achieve Aug (43) 83.61 DTm / 3600 100.52 boxes (46)	+ 36 a water us Sep 87.17 0 kWh/mon 101.72	Oct 90.73 Fotal = Sur 118.55 Fotal = Sur	Nov 94.29 m(44) ₁₁₂ = ables 1b, 1 129.4 m(45) ₁₁₂ =	97.84 = c, 1d) 140.52		(.
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if TFA nnual a educe the ot water 4)m= mergy con instantar 6)m= tater st	£ 13.9 average annual hat 125 Jan usage ir 97.84 ntent of 145.1 neous was 21.77 corage	P, N = 1 e hot wa I average litres per p Feb n litres per 94.29 hot water 126.91 ater heatin 19.04 loss:	hot water person per Mar day for ea 90.73 used - calc 130.96 ng at point 19.64	ge in litre usage by day (all w Apr ach month 87.17 culated mo 114.17 of use (no	es per da 5% if the of vater use, if May Vd,m = fa 83.61	ay Vd,av Iwelling is that and co Jun ctor from 1 80.05 190 x Vd,r 94.53 r storage),	erage = designed Id) Jul Table 1c x 80.05 m x nm x E 87.6 enter 0 in 13.14	(25 x N) to achieve Aug (43) 83.61 DTm / 3600 100.52 boxes (46)	+ 36 a water us Sep 87.17 0 kWh/mort 101.72 0 to (61) 15.26	Oct 90.73 Fotal = Sur 118.55 Fotal = Sur 17.78	Nov 94.29 m(44) ₁₁₂ = ables 1b, 1 129.4 m(45) ₁₁₂ =	97.84 = c, 1d) 140.52		
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if TFA nnual a educe the transfer to the trans	£ 13.9 average e annua hat 125 Jan usage ir 97.84 ntent of 145.1 neous w. 21.77 orage volume unity here if no corage nufaction of ature factors where the series of the factor is factor if factor if a turn in the factor is the factor is the series of the factor is the factor is a turn in the factor is the factor in the factor is the factor in the factor is the factor in the	Poor N = 1	Mar day for ea 90.73 used - calconder 130.96 including at point 19.64 including and no talconder the storage eclared of factor free sections.	ge in litre usage by day (all w Apr ach month 87.17 culated mo 114.17 of use (no 17.13 ag any so ank in dw er (this in cuss facto 2b , kWh/ye cylinder I com Tabl on 4.3	es per da 5% if the of	ay Vd,av livelling is hot and co Jun ctor from 80.05 190 x Vd,r 94.53 r storage), 14.18 /WHRS enter 110 nstantar wn (kWh	erage = designed Id) Jul Table 1c x 80.05 87.6 enter 0 in 13.14 storage 0 litres in neous con/day): known:	(25 x N) to achieve Aug (43) 83.61 07m / 3600 100.52 boxes (46) 15.08 within sa (47) ombi boil	+ 36 a water us Sep 87.17 0 kWh/mor 101.72 0 to (61) 15.26 ame vess ers) ente	Oct 90.73 Fotal = Sunth (see Tail 118.55) Fotal = Sunth 17.78 Seel	Nov 94.29 m(44) ₁₁₂ = abbles 1b, 1 129.4 m(45) ₁₁₂ = 19.41	Dec 97.84 = c, 1d) 140.52 = 21.08 0 0 0 0 0		(.) (.) (.) (.) (.)

Energy lost from water storage,	kWh/year			(47) x (51)) x (52) x (5	53) =		0		(54)
Enter (50) or (54) in (55)								0		(55)
Water storage loss calculated for	or each month			((56)m = (55) × (41)r	n				
(56)m= 0 0 0	0 0	0	0	0	0	0	0	0		(56)
If cylinder contains dedicated solar stora	age, (57)m = (56)m	x [(50) – (l	H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0 0 0	0 0	0	0	0	0	0	0	0		(57)
Primary circuit loss (annual) from	m Table 3							0		(58)
Primary circuit loss calculated for	or each month (59)m = (58) ÷ 36	55 × (41)	m					
(modified by factor from Table	e H5 if there is s	olar wat	er heatir	ng and a	cylinde	thermo	stat)			
(59)m = 0 0 0	0 0	0	0	0	0	0	0	0		(59)
Combi loss calculated for each	month (61)m = ((60) ÷ 36	65 × (41))m						
(61)m= 25.82 23.29 25.75	24.87 25.67	24.8	25.6	25.64	24.84	25.72	24.94	25.8		(61)
Total heat required for water he	ating calculated	for each	n month	(62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 170.92 150.2 156.7	139.04 135.22	119.33	113.2	126.17	126.56	144.26	154.34	166.33		(62)
Solar DHW input calculated using Appe	endix G or Appendix	H (negativ	e quantity	/) (enter '0	' if no sola	contributi	on to wate	er heating)	'	
(add additional lines if FGHRS a	and/or WWHRS	applies,	see Ap	pendix (3)					
(63)m= 0 0 0	0 0	0	0	0	0	0	0	0		(63)
Output from water heater	•				•				•	
(64)m= 170.92 150.2 156.7	139.04 135.22	119.33	113.2	126.17	126.56	144.26	154.34	166.33		
	1			Outp	out from wa	ater heater	(annual)₁	12	1702.27	(64)
Heat gains from water heating,	kWh/month 0.25	5 ′ [0 85	v (45)m	⊥ (61)m	1 ± 0 8 v	[(46)m	+ (57)m	± (50)m	1	
		_ [0.00	^ (TU/III	T (01)11	ı] + 0.0 A	. [(4 0)iii	· (01)111	T (33)111]	
(65)m= 54.7 48.02 49.98	44.18 42.84	37.63	35.53	39.83	40.03	45.85	49.26	53.17]	(65)
(65)m= 54.7 48.02 49.98	44.18 42.84	37.63	35.53	39.83	40.03	45.85	49.26	53.17		(65)
(65)m= 54.7 48.02 49.98 include (57)m in calculation o	44.18 42.84 f (65)m only if cy	37.63	35.53	39.83	40.03	45.85	49.26	53.17		(65)
include (57)m in calculation o 5. Internal gains (see Table 5	44.18 42.84 f (65)m only if cyand 5a):	37.63	35.53	39.83	40.03	45.85	49.26	53.17		(65)
include (57)m in calculation o 5. Internal gains (see Table 5 Metabolic gains (Table 5), Watta	44.18 42.84 f (65)m only if cyand 5a):	37.63	35.53	39.83 dwelling	40.03 or hot w	45.85 ater is fr	49.26	53.17		(65)
include (57)m in calculation o 5. Internal gains (see Table 5 Metabolic gains (Table 5), Watta	44.18 42.84 f (65)m only if cyand 5a):	37.63 ylinder is	35.53	39.83	40.03	45.85	49.26 om com	53.17 munity h		(65)
(65)m= 54.7 48.02 49.98 include (57)m in calculation o 5. Internal gains (see Table 5 Metabolic gains (Table 5), Watter Jan Feb Mar (66)m= 138.32 138.32 138.32	44.18 42.84 f (65)m only if cy and 5a): S Apr May 138.32 138.32	37.63 ylinder is Jun 138.32	35.53 s in the c	39.83 dwelling Aug 138.32	40.03 or hot was Sep 138.32	45.85 ater is fr	49.26 om com	53.17 munity h		
include (57)m in calculation o 5. Internal gains (see Table 5) Metabolic gains (Table 5), Watte Jan Feb Mar (66)m= 138.32 138.32 138.32 Lighting gains (calculated in Apple)	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati	37.63 ylinder is Jun 138.32	35.53 s in the c	39.83 dwelling Aug 138.32 lso see	40.03 or hot was Sep 138.32 Table 5	45.85 ater is fr	49.26 om com	53.17 munity h		
(65)m= 54.7 48.02 49.98 include (57)m in calculation of the control of the c	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67	37.63 ylinder is Jun 138.32 on L9 or 17.45	35.53 s in the o Jul 138.32 L9a), a 18.86	39.83 dwelling Aug 138.32 lso see 24.51	40.03 or hot was Sep 138.32 Table 5 32.9	45.85 ater is fr Oct 138.32	49.26 om com Nov 138.32	53.17 munity h		(66)
include (57)m in calculation o 5. Internal gains (see Table 5 Metabolic gains (Table 5), Watte Jan Feb Mar (66)m= 138.32 138.32 138.32 Lighting gains (calculated in Appliances gains (calculated in	44.18 42.84 f (65)m only if cy and 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67 Appendix L, equ	Jun 138.32 on L9 or 17.45	35.53 s in the o Jul 138.32 L9a), a 18.86	39.83 dwelling Aug 138.32 lso see 24.51 3a), also	40.03 or hot was Sep 138.32 Table 5 32.9 o see Tal	45.85 ater is fr Oct 138.32 41.78 ble 5	49.26 om com Nov 138.32	53.17 munity h Dec 138.32		(66)
include (57)m in calculation o 5. Internal gains (see Table 5) Metabolic gains (Table 5), Watts Jan Feb Mar (66)m= 138.32 138.32 138.32 Lighting gains (calculated in Apr (67)m= 50.57 44.92 36.53 Appliances gains (calculated in (68)m= 303.07 306.22 298.29	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67 Appendix L, equ 281.42 260.13	37.63 ylinder is Jun 138.32 on L9 or 17.45 uation L' 240.11	35.53 s in the o Jul 138.32 L9a), a 18.86 13 or L1: 226.74	39.83 dwelling Aug 138.32 lso see 24.51 3a), also 223.59	40.03 or hot was Sep 138.32 Table 5 32.9 o see Tal 231.52	45.85 ater is fr Oct 138.32 41.78 ble 5 248.39	49.26 om com Nov 138.32	53.17 munity h		(66) (67)
include (57)m in calculation of 5. Internal gains (see Table 5) Metabolic gains (Table 5), Wattabolic gains (Tabl	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67 Appendix L, equ 281.42 260.13	37.63 ylinder is Jun 138.32 on L9 or 17.45 uation L² 240.11 ion L15	35.53 S in the control of the contro	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59	40.03 or hot was Sep 138.32 Table 5 32.9 o see Tall 231.52 ee Table	45.85 ater is fr Oct 138.32 41.78 ble 5 248.39 5	49.26 om com Nov 138.32 48.76	53.17 munity h Dec 138.32 51.98		(66) (67) (68)
include (57)m in calculation o 5. Internal gains (see Table 5 Metabolic gains (Table 5), Watte Jan Feb Mar (66)m= 138.32 138.32 138.32 Lighting gains (calculated in Appliances gains (calculated in (68)m= 303.07 306.22 298.29 Cooking gains (calculated in Appliances gains (calculate	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67 Appendix L, equ 281.42 260.13 pendix L, equati 51.14 51.14	37.63 ylinder is Jun 138.32 on L9 or 17.45 uation L' 240.11	35.53 s in the o Jul 138.32 L9a), a 18.86 13 or L1: 226.74	39.83 dwelling Aug 138.32 lso see 24.51 3a), also 223.59	40.03 or hot was Sep 138.32 Table 5 32.9 o see Tal 231.52	45.85 ater is fr Oct 138.32 41.78 ble 5 248.39	49.26 om com Nov 138.32	53.17 munity h Dec 138.32		(66) (67)
include (57)m in calculation of 5. Internal gains (see Table 5). Metabolic gains (Table 5), Watts Jan Feb Mar (66)m= 138.32 138.32 138.32 Lighting gains (calculated in Appliances gains (calculated in (68)m= 303.07 306.22 298.29 Cooking gains (calculated in Appliances gains (calculated in Appliances gains (calculated in (68)m= 51.14 51.14 51.14 Pumps and fans gains (Table 55).	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67 Appendix L, equ 281.42 260.13 pendix L, equati 51.14 51.14 a)	37.63 ylinder is Jun 138.32 on L9 or 17.45 uation L ² 240.11 ion L15 of 51.14	Jul 138.32 L9a), a 18.86 13 or L1: 226.74 or L15a) 51.14	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59 , also se 51.14	40.03 or hot was Sep 138.32 Table 5 32.9 o see Tal 231.52 ee Table 51.14	45.85 ater is fr Oct 138.32 41.78 ble 5 248.39 5 51.14	49.26 om com Nov 138.32 48.76 269.69	53.17 munity h Dec 138.32 51.98 289.7		(66) (67) (68) (69)
include (57)m in calculation of 5. Internal gains (see Table 5) Metabolic gains (Table 5), Watta Jan Feb Mar (66)m= 138.32 138.32 138.32 138.32 Lighting gains (calculated in Appliances gains (calculated in (68)m= 303.07 306.22 298.29 Cooking gains (calculated in Appliances gains (calc	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67 Appendix L, equ 281.42 260.13 pendix L, equati 51.14 51.14 a) 3 3	37.63 ylinder is Jun 138.32 on L9 or 17.45 uation L7 240.11 ion L15 51.14	35.53 S in the control of the contro	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59	40.03 or hot was Sep 138.32 Table 5 32.9 o see Tall 231.52 ee Table	45.85 ater is fr Oct 138.32 41.78 ble 5 248.39 5	49.26 om com Nov 138.32 48.76	53.17 munity h Dec 138.32 51.98		(66) (67) (68)
include (57)m in calculation o 5. Internal gains (see Table 5) Metabolic gains (Table 5), Watts Jan Feb Mar (66)m= 138.32 138.32 138.32 Lighting gains (calculated in Appliances gains (calculated in (68)m= 303.07 306.22 298.29 Cooking gains (calculated in Appliances gains (calcula	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67 Appendix L, equati 281.42 260.13 pendix L, equati 51.14 51.14 a) 3 3 ve values) (Tab	37.63 ylinder is Jun 138.32 on L9 or 17.45 uation L' 240.11 ion L15 51.14 3 le 5)	35.53 s in the o Jul 138.32 L9a), a 18.86 13 or L1: 226.74 or L15a) 51.14	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59 , also se 51.14	40.03 or hot was Sep 138.32 Table 5 32.9 o see Tall 231.52 ee Table 51.14	45.85 ater is fr Oct 138.32 41.78 ble 5 248.39 5 51.14	49.26 om com Nov 138.32 48.76 269.69	53.17 munity h Dec 138.32 51.98 289.7		(66) (67) (68) (69) (70)
include (57)m in calculation of 5. Internal gains (see Table 5). Metabolic gains (Table 5), Watts Jan Feb Mar (66)m= 138.32 138.32 138.32 138.32 Lighting gains (calculated in Appliances gains (calculated in (67)m= 50.57 44.92 36.53 Appliances gains (calculated in (68)m= 303.07 306.22 298.29 Cooking gains (calculated in Appliances gains (calculated	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67 Appendix L, equ 281.42 260.13 pendix L, equati 51.14 51.14 a) 3 3	37.63 ylinder is Jun 138.32 on L9 or 17.45 uation L7 240.11 ion L15 51.14	Jul 138.32 L9a), a 18.86 13 or L1: 226.74 or L15a) 51.14	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59 , also se 51.14	40.03 or hot was Sep 138.32 Table 5 32.9 o see Tal 231.52 ee Table 51.14	45.85 ater is fr Oct 138.32 41.78 ble 5 248.39 5 51.14	49.26 om com Nov 138.32 48.76 269.69	53.17 munity h Dec 138.32 51.98 289.7		(66) (67) (68) (69)
include (57)m in calculation of 5. Internal gains (see Table 5) Metabolic gains (Table 5), Watte Jan Feb Mar (66)m= 138.32 138.32 138.32 138.32 Lighting gains (calculated in Appliances gains (calculated in (68)m= 303.07 306.22 298.29 Cooking gains (calculated in Appliances gains (calc	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67 Appendix L, equati 51.14 51.14 a) 3 3 ive values) (Table -92.21	37.63 ylinder is Jun 138.32 on L9 or 17.45 uation L' 240.11 ion L15 51.14 3 le 5) -92.21	35.53 S in the control of the contro	39.83 dwelling Aug 138.32 lso see 24.51 3a), also 223.59 , also se 51.14 3	40.03 or hot was Sep 138.32 Table 5 32.9 o see Table 231.52 ee Table 51.14	45.85 ater is fr Oct 138.32 41.78 ble 5 248.39 5 51.14	49.26 om com Nov 138.32 48.76 269.69 51.14 3	53.17 munity h Dec 138.32 51.98 289.7 51.14 3		(66) (67) (68) (69) (70)
include (57)m in calculation of 5. Internal gains (see Table 5) Metabolic gains (Table 5), Watts Jan Feb Mar (66)m= 138.32 138.32 138.32 138.32 Lighting gains (calculated in Apr (67)m= 50.57 44.92 36.53 Appliances gains (calculated in (68)m= 303.07 306.22 298.29 Cooking gains (calculated in Apr (69)m= 51.14 51.14 51.14 Pumps and fans gains (Table 56 (70)m= 3 3 3 3 Losses e.g. evaporation (negation (71)m= -92.21 -92.21 -92.21 Water heating gains (Table 5) (72)m= 73.52 71.46 67.18	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67 Appendix L, equati 281.42 260.13 pendix L, equati 51.14 51.14 a) 3 3 ve values) (Tab	37.63 ylinder is Jun 138.32 on L9 or 17.45 uation L' 240.11 ion L15 51.14 3 le 5) -92.21	35.53 s in the c Jul 138.32 L9a), a 18.86 13 or L1: 226.74 or L15a) 51.14 3 -92.21	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59 , also se 51.14 3	40.03 or hot was Sep 138.32 Table 5 32.9 o see Tall 231.52 ee Table 51.14	45.85 ater is fr Oct 138.32 41.78 ble 5 248.39 5 51.14 3 -92.21	49.26 om com Nov 138.32 48.76 269.69 51.14 3 -92.21	53.17 munity h Dec 138.32 51.98 289.7 51.14 3 -92.21		(66) (67) (68) (69) (70)
include (57)m in calculation of 5. Internal gains (see Table 5). Watts Jan Feb Mar (66)m= 138.32 138.32 138.32 138.32 Lighting gains (calculated in Appliances gains (Table 51.14 S1.14	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67 Appendix L, equati 51.14 51.14 a) 3 3 ive values) (Table-92.21 61.36 57.58	37.63 ylinder is Jun 138.32 on L9 or 17.45 uation L ² 240.11 ion L15 51.14 3 le 5) -92.21	35.53 S in the control of the contro	39.83 dwelling Aug 138.32 lso see 24.51 3a), also 223.59 a, also se 51.14 3 -92.21 53.54 a + (68)m +	40.03 or hot was Sep 138.32 Table 5 32.9 see Table 231.52 ee Table 51.14 3 -92.21	45.85 ater is fr Oct 138.32 41.78 ble 5 248.39 5 51.14 3 -92.21 61.62 70)m + (7	49.26 om com Nov 138.32 48.76 269.69 51.14 3 -92.21 68.42 1)m + (72)	53.17 munity h Dec 138.32 51.98 289.7 51.14 3 -92.21 71.47		(66) (67) (68) (69) (70) (71)
include (57)m in calculation of 5. Internal gains (see Table 5) Metabolic gains (Table 5), Watts Jan Feb Mar (66)m= 138.32 138.32 138.32 138.32 Lighting gains (calculated in Apr (67)m= 50.57 44.92 36.53 Appliances gains (calculated in (68)m= 303.07 306.22 298.29 Cooking gains (calculated in Apr (69)m= 51.14 51.14 51.14 Pumps and fans gains (Table 56 (70)m= 3 3 3 3 Losses e.g. evaporation (negation (71)m= -92.21 -92.21 -92.21 Water heating gains (Table 5) (72)m= 73.52 71.46 67.18	44.18 42.84 If (65)m only if cyand 5a): S Apr May 138.32 138.32 pendix L, equati 27.66 20.67 Appendix L, equati 51.14 51.14 a) 3 3 ive values) (Table -92.21	37.63 ylinder is Jun 138.32 on L9 or 17.45 uation L' 240.11 ion L15 51.14 3 le 5) -92.21	35.53 s in the c Jul 138.32 L9a), a 18.86 13 or L1: 226.74 or L15a) 51.14 3 -92.21	39.83 dwelling 138.32 lso see 24.51 3a), also 223.59 , also se 51.14 3	40.03 or hot was Sep 138.32 Table 5 32.9 o see Tall 231.52 ee Table 51.14	45.85 ater is fr Oct 138.32 41.78 ble 5 248.39 5 51.14 3 -92.21	49.26 om com Nov 138.32 48.76 269.69 51.14 3 -92.21	53.17 munity h Dec 138.32 51.98 289.7 51.14 3 -92.21		(66) (67) (68) (69) (70)

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Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientat	tion:	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	0.39	x	10.63	x	0.63	x	0.7] =	1.27	(74)
North	0.9x	0.77	x	0.39	x	10.63	х	0.63	x	0.7	=	1.27	(74)
North	0.9x	0.77	х	0.39	x	20.32	х	0.63	x	0.7	=	2.42	(74)
North	0.9x	0.77	x	0.39	x	20.32	x	0.63	x	0.7] =	2.42	(74)
North	0.9x	0.77	x	0.39	x	34.53	х	0.63	x	0.7	=	4.12	(74)
North	0.9x	0.77	x	0.39	x	34.53	x	0.63	x	0.7	=	4.12	(74)
North	0.9x	0.77	x	0.39	x	55.46	x	0.63	x	0.7	=	6.61	(74)
North	0.9x	0.77	x	0.39	x	55.46	x	0.63	x	0.7	=	6.61	(74)
North	0.9x	0.77	x	0.39	x	74.72	x	0.63	x	0.7	=	8.91	(74)
North	0.9x	0.77	x	0.39	x	74.72	x	0.63	x	0.7	=	8.91	(74)
North	0.9x	0.77	x	0.39	x	79.99	x	0.63	x	0.7	=	9.53	(74)
North	0.9x	0.77	x	0.39	x	79.99	x	0.63	x	0.7	=	9.53	(74)
North	0.9x	0.77	x	0.39	x	74.68	x	0.63	x	0.7	=	8.9	(74)
North	0.9x	0.77	x	0.39	x	74.68	x	0.63	x	0.7	=	8.9	(74)
North	0.9x	0.77	x	0.39	x	59.25	x	0.63	x	0.7	=	7.06	(74)
North	0.9x	0.77	x	0.39	x	59.25	x	0.63	x	0.7	=	7.06	(74)
North	0.9x	0.77	x	0.39	x	41.52	x	0.63	x	0.7	=	4.95	(74)
North	0.9x	0.77	x	0.39	x	41.52	x	0.63	x	0.7	=	4.95	(74)
North	0.9x	0.77	x	0.39	x	24.19	x	0.63	x	0.7	=	2.88	(74)
North	0.9x	0.77	x	0.39	x	24.19	x	0.63	x	0.7	=	2.88	(74)
North	0.9x	0.77	x	0.39	x	13.12	x	0.63	x	0.7	=	1.56	(74)
North	0.9x	0.77	x	0.39	x	13.12	x	0.63	x	0.7	=	1.56	(74)
North	0.9x	0.77	x	0.39	x	8.86	X	0.63	x	0.7	=	1.06	(74)
North	0.9x	0.77	x	0.39	x	8.86	X	0.63	x	0.7	=	1.06	(74)
East	0.9x	0.77	X	2.98	x	19.64	X	0.63	X	0.7	=	17.89	(76)
East	0.9x	0.77	x	1.14	x	19.64	x	0.63	x	0.7	=	6.84	(76)
East	0.9x	0.77	X	1.25	x	19.64	x	0.63	X	0.7	=	7.5	(76)
East	0.9x	0.77	x	2.98	x	38.42	x	0.63	x	0.7	=	34.99	(76)
East	0.9x	0.77	x	1.14	X	38.42	X	0.63	x	0.7	=	13.39	(76)
East	0.9x	0.77	X	1.25	x	38.42	x	0.63	X	0.7	=	14.68	(76)
East	0.9x	0.77	X	2.98	x	63.27	x	0.63	X	0.7	=	57.62	(76)
East	0.9x	0.77	x	1.14	x	63.27	x	0.63	X	0.7	=	22.04	(76)
East	0.9x	0.77	X	1.25	x	63.27	x	0.63	X	0.7	=	24.17	(76)
East	0.9x	0.77	X	2.98	X	92.28	X	0.63	X	0.7	=	84.04	(76)
East	0.9x	0.77	x	1.14	x	92.28	X	0.63	X	0.7	=	32.15	(76)
East	0.9x	0.77	x	1.25	x	92.28	x	0.63	x	0.7	=	35.25	(76)
East	0.9x	0.77	x	2.98	x	113.09	x	0.63	x	0.7	=	103	(76)
East	0.9x	0.77	x	1.14	x	113.09	x	0.63	x	0.7	=	39.4	(76)
East	0.9x	0.77	X	1.25	X	113.09	x	0.63	X	0.7] =	43.2	(76)

Foot	۰. ۲		1		1		1		1		1		7(70)
East	0.9x	0.77	X	2.98	X	115.77	X	0.63	X	0.7] = 1	105.44	(76)
East	0.9x	0.77	X	1.14	X	115.77	X	0.63	X	0.7	=	40.33	(76)
East	0.9x	0.77	X	1.25	X	115.77	X	0.63	X	0.7	=	44.23	(76)
East -	0.9x	0.77	X	2.98	X	110.22	X	0.63	X	0.7] =	100.38	(76)
East	0.9x	0.77	X	1.14	X	110.22	X	0.63	X	0.7	=	38.4	(76)
East	0.9x	0.77	X	1.25	X	110.22	X	0.63	X	0.7	=	42.11	(76)
East	0.9x	0.77	X	2.98	X	94.68	Х	0.63	X	0.7	=	86.22	(76)
East	0.9x	0.77	X	1.14	X	94.68	X	0.63	X	0.7	=	32.98	(76)
East	0.9x	0.77	X	1.25	X	94.68	X	0.63	X	0.7	=	36.17	(76)
East	0.9x	0.77	X	2.98	X	73.59	X	0.63	X	0.7	=	67.02	(76)
East	0.9x	0.77	X	1.14	X	73.59	X	0.63	X	0.7	=	25.64	(76)
East	0.9x	0.77	X	1.25	X	73.59	X	0.63	X	0.7	=	28.11	(76)
East	0.9x	0.77	X	2.98	X	45.59	X	0.63	x	0.7	=	41.52	(76)
East	0.9x	0.77	X	1.14	X	45.59	X	0.63	X	0.7	=	15.88	(76)
East	0.9x	0.77	X	1.25	X	45.59	x	0.63	X	0.7	=	17.42	(76)
East	0.9x	0.77	X	2.98	X	24.49	X	0.63	X	0.7	=	22.3	(76)
East	0.9x	0.77	X	1.14	X	24.49	X	0.63	X	0.7	=	8.53	(76)
East	0.9x	0.77	X	1.25	X	24.49	X	0.63	X	0.7	=	9.36	(76)
East	0.9x	0.77	X	2.98	x	16.15	x	0.63	x	0.7	=	14.71	(76)
East	0.9x	0.77	X	1.14	X	16.15	x	0.63	x	0.7	=	5.63	(76)
East	0.9x	0.77	X	1.25	X	16.15	X	0.63	X	0.7	=	6.17	(76)
West	0.9x	0.77	X	1.17	X	19.64	x	0.63	x	0.7	=	7.02	(80)
West	0.9x	0.77	X	1.12	X	19.64	x	0.63	x	0.7	=	6.72	(80)
West	0.9x	0.77	X	1.17	X	38.42	x	0.63	x	0.7	=	13.74	(80)
West	0.9x	0.77	X	1.12	X	38.42	x	0.63	x	0.7	=	13.15	(80)
West	0.9x	0.77	X	1.17	X	63.27	x	0.63	x	0.7	=	22.62	(80)
West	0.9x	0.77	X	1.12	X	63.27	x	0.63	x	0.7	=	21.66	(80)
West	0.9x	0.77	X	1.17	X	92.28	x	0.63	x	0.7	=	33	(80)
West	0.9x	0.77	X	1.12	X	92.28	X	0.63	x	0.7	=	31.59	(80)
West	0.9x	0.77	X	1.17	X	113.09	x	0.63	x	0.7	=	40.44	(80)
West	0.9x	0.77	X	1.12	x	113.09	х	0.63	x	0.7	=	38.71	(80)
West	0.9x	0.77	X	1.17	x	115.77	x	0.63	x	0.7	=	41.4	(80)
West	0.9x	0.77	X	1.12	x	115.77	х	0.63	x	0.7	=	39.63	(80)
West	0.9x	0.77	x	1.17	x	110.22	x	0.63	x	0.7	=	39.41	(80)
West	0.9x	0.77	x	1.12	x	110.22	x	0.63	x	0.7	=	37.73	(80)
West	0.9x	0.77	x	1.17	x	94.68	x	0.63	x	0.7	j =	33.85	(80)
West	0.9x	0.77	x	1.12	x	94.68	x	0.63	x	0.7	=	32.41	(80)
West	0.9x	0.77	x	1.17	x	73.59	x	0.63	x	0.7	j =	26.31	(80)
West	0.9x	0.77	x	1.12	x	73.59	x	0.63	x	0.7	j =	25.19	(80)
West	0.9x	0.77	x	1.17	x	45.59	x	0.63	x	0.7] =	16.3	(80)
West	0.9x	0.77	×	1.12	x	45.59	x	0.63	x	0.7	j =	15.6	(80)
	_						•		ı		•		_

West	0.9x	0.77	X	1.1	7	x	24.49	x	0.63	x	0.7		8.76	(80)
West	0.9x	0.77	x	1.1	2	x	24.49	X	0.63	x	0.7	=	8.38	(80)
West	0.9x	0.77	x	1.1	7	X	16.15	X	0.63	х	0.7	=	5.78	(80)
West	0.9x	0.77	x	1.1	2	x	16.15	х	0.63	_ x [0.7	=	5.53	(80)
	_		 -											_
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m														
(83)m=	48.51	94.79	156.35	229.25	282.56	290.09	275.82	235.76	182.17	112.49	60.46	39.92		(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts										l				
(84)m=	575.92	617.62	658.6	699.93	721.18	700.15	669.41	637.64	602.43	564.52	547.56	553.32		(84)
7. Mean internal temperature (heating season)														
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)														
•		_	ains for I			_		5.5 5, 11	()				21	
	Jan	Feb	Mar		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(96)~		0.92	0.89	Apr 0.84	-	0.61	+	Ť	0.7	-	0.92	0.94		(86)
(86)m=	0.94	0.92	0.69	0.64	0.74	0.61	0.48	0.51	0.7	0.85	0.92	0.94		(00)
Mean	interna	temper	ature in l	iving are	ea T1 (fo	llow st	eps 3 to	7 in Tabl	e 9c)				•	
(87)m=	18.93	19.13	19.51	20.01	20.45	20.78	20.92	20.9	20.66	20.1	19.44	18.89		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dwellin	g from Ta	able 9, T	h2 (°C)					
(88)m=	19.97	19.97	19.97	19.98	19.99	19.99	19.99	19.99	19.99	19.99	19.98	19.98		(88)
L	tion for				ا ممالامیا	-0 /-	- Toblo	. 00\	<u> </u>		<u> </u>	<u> </u>		
г	0.93	0.91	0.88	0.81			ee Table		0.64	0.82	0.91	0.94		(89)
(89)m=	0.93	0.91	0.00	0.61	0.7	0.54	0.36	0.42	0.64	0.82	0.91	0.94		(09)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)														
(90)m=	18.1	18.3	18.67	19.15	19.57	19.85	19.95	19.94	19.76	19.25	18.61	18.06		(90)
$fLA = Living area \div (4) = 0.17 \tag{91}$														
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lina) =	fLA × T1	+ (1 – fl	A) × T2					_
(92)m=	18.24	18.44	18.81	19.3	19.72	20.02	20.12	20.11	19.92	19.4	18.75	18.2		(92)
L	adiustn	nent to th	he mean	internal	temper	ature fr	om Table	4e. who	ere appro	noriate	<u> </u>	<u> </u>		
(93)m=	18.09	18.29	18.66	19.15	19.57	19.87	19.97	19.96	19.77	19.25	18.6	18.05		(93)
	ice hea	tina reau	uirement											
		·		nperatui	e obtain	ed at s	tep 11 of	Table 9	b. so tha	nt Ti.m=(76)m an	d re-cald	culate	
			or gains ເ						.,	, (,			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm				•	•	•	•	•	•	•	
(94)m=	0.91	0.89	0.85	0.79	0.68	0.53	0.38	0.42	0.62	0.8	0.88	0.92		(94)
Useful	l gains,	hmGm ,	W = (94	l)m x (8	4)m		-	•	•	•	•	•	•	
(95)m=	523.98	550.23	562.56	550.17	491.1	371.53	256.2	266.34	374.14	451.49	483.66	507.3		(95)
Month	ly avera	age exte	rnal tem	perature	from Ta	able 8	•	•	•	•	•	•	'	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat lo	oss rate	for mea	an intern	al tempe	erature,	Lm , W	=[(39)m	x [(93)m	– (96)m]	•	•	ı	
(97)m=	1136.94	1101.59	998.33	833.21	638.72	423.45	271.2	285.84	457.31	701.36	936.5	1132.59		(97)
Space	heatin	g require	ement fo	r each n	nonth, k\	Wh/mo	-1	24 x [(97)m – (95	5)m] x (4	1)m		ı	
(98)m=	456.04	370.52	324.21	203.79	109.82	0	0	0	0	185.91	326.04	465.22		
_								Tota	al per year	(kWh/year	r) = Sum(9	8)15,912 =	2441.55	(98)
Snace	heatin	a require	ement in	k\/\/h/m2	!/vear				-	-	·		33.68	(99)
Space	ricatiii	y roquire		14 V V I I/ I I I	, y cai								33.00	

Space heating:	9a. Energy requirements – Individual heating	svstems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system fs	Space heating:	oyoto mo i	Holdaling	,-/moro	7-11-)——————————————————————————————————					_
Fraction of total heating from main system 1 (204) = (202) × (1 - (203)) = 1 (204) (202) × (1 - (203)) = 1 (204) (202) (205) (Fraction of space heat from secondary/supp	lementary	system						0	(201)
Secondary supplementary heating system	Fraction of space heat from main system(s)			(202) = 1	- (201) =				1	(202)
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year	Fraction of total heating from main system 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWhiyear	Efficiency of main space heating system 1								92.4	(206)
Space heating requirement (calculated above)	Efficiency of secondary/supplementary heati	ng systen	n, %						0	(208)
	Jan Feb Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
211)m = {[(98)m x (204)] } x 100 ÷ (206)	· - · · · · · · · · · · · · · · · · · ·	-i							1	
A33.55		2 0	0	0	0	185.91	326.04	465.22		
Total (kWh/year) = Sum(211), sss_t=" 2642.37 (211) Space heating fuel (secondary), kWh/month ([(98)m x (201)] \ \cdot x \ (201)] \ \cdot x \ (208) 15)m	`		Ι ο	Ι ,		004.0	050.00	T 500 40	1	(211)
Space heating fuel (secondary), kWh/month {{([98)m x (201)] } x 100 ÷ (208)} {\$15 m } 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	493.55 400.99 350.88 220.55 118.86	9 0	0						2642.27	7(211)
(198)m x (201) x 100 ÷ (208)	Space heating fuel (secondary) k\M/h/menth			1018	ii (KVVII/ yCc	ar) =Ouri	211/15,1012	2	2642.37	(211)
15 m 0										
Atter heating sutput from water heater (calculated above) 170.92 150.2 156.7 139.04 135.22 119.33 113.2 126.17 126.56 144.26 154.34 166.33 170.92 150.2 156.7 139.04 135.22 119.33 113.2 126.17 126.56 144.26 154.34 166.33 170.92 150.2 156.7 139.04 135.22 119.33 113.2 126.17 126.56 144.26 154.34 166.33 170.92 150.2 150.3 150.3 150.3 150.2 150.3 150.2 150.3 150.12 145.02 145.47 162.71 173.39 186.49 190.2 190.2 190.2 145.42 145.47 162.71 173.39 186.49 190.2 190.2 190.2 190.2 145.47 162.71 173.39 186.49 190.2 190.2 190.2 190.2 145.47 162.71 173.39 186.49 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2 190.2		0	0	0	0	0	0	0]	
Trough the start (calculated above) 170.92		•	•	Tota	l (kWh/yea	ar) =Sum(215),15,1012		0	(215)
170.92 150.2 156.7 139.04 135.22 119.33 113.2 126.17 126.56 144.26 154.34 166.33 170.92 150.2 156.7 139.04 135.22 119.33 113.2 126.17 126.56 144.26 154.34 166.33 170.91 89.16 89.11 89 88.76 88.32 87 87 87 87 88.66 89.01 89.19 170.91 190.91 190.91 190.91 190.91 190.91 190.91 191.7 168.55 176.07 156.65 153.1 137.16 130.12 145.02 145.47 162.71 173.39 186.49 190.91 191.7 168.55 176.07 156.65 153.1 137.16 130.12 145.02 145.47 162.71 173.39 186.49 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.91 190.9	Water heating									_
fficiency of water heater 17)m= 89.16 89.11 89 88.76 88.32 87 87 87 87 88.66 89.01 89.19 19)m= (64)m x 100 ÷ (217)m 19)m= 191.7 168.55 176.07 156.65 153.1 137.16 130.12 145.02 145.47 162.71 173.39 186.49 Total = Sum(219a), = 1926.42 (219)m 190ms queltor water heating, kWh/year 190ms queltor water heating fuel used, main system 1 190ms queltor water heating fuel used, main system 1 2642.37 190ms queltor water heating fuel used, main system 1 2642.37 2642.3	Output from water heater (calculated above)	140.22	T 442.0	106 17	100 50	144.06	154.24	166.22	1	
17)m= 89.16 89.11 89 88.76 88.32 87 87 87 87 88.66 89.01 89.19 usel for water heating, kWh/month 219)m= (64)m x 100 ÷ (217)m 19)m= 191.7 168.55 176.07 156.65 153.1 137.16 130.12 145.02 145.47 162.71 173.39 186.49 Total = Sum(219a), p = 1926.42 (219) kWh/year		119.33	113.2	120.17	120.30	144.26	154.34	100.33	97	7(216)
usel for water heating, kWh/month 19)m = (64)m x 100 ÷ (217)m 19)m = 191.7 168.55 176.07 156.65 153.1 137.16 130.12 145.02 145.47 162.71 173.39 186.49 Total = Sum(219a) ₁₋₁₂ = 1926.42 (219) mnual totals pace heating fuel used, main system 1 //ater heating fuel used //ater heating pump: //ater heating fuel used //ater heating fuel		87	87	87	87	88.66	89.01	89.19	01	
219)m = (64)m x 100 ÷ (217)m 19)m = 191.7 168.55 176.07 156.65 153.1 137.16 130.12 145.02 145.47 162.71 173.39 186.49 Total = Sum(219a) ₁₉ = 1926.42 (219) Innual totals pace heating fuel used, main system 1 //ater heating fuel used lectricity for pumps, fans and electric keep-hot central heating pump: 30 (230c) coller with a fan-assisted flue otal electricity for the above, kWh/year lectricity for lighting lectricity generated by PVs otal electricity generated by PVs otal electricity generated by PVs otal delivered energy for all uses (211)(221) + (231) + (232)(237b) = 3636.19 (338) Fuel kWh/year Fuel Fuel Price					<u> </u>	00.00	1 00.01	1 000	J	,
Innual totals pace heating fuel used, main system 1 Water heating fuel used Idectricity for pumps, fans and electric keep-hot Contral heating pump: Coolier with a fan-assisted flue Cotal electricity for the above, kWh/year Idectricity for lighting Idectricity for lighting Idectricity generated by PVs Cotal delivered energy for all uses (211)(221) + (231) + (232)(237b) = Total = Sum(219a)2 = 1926.42 192	(219)m = (64)m x 100 ÷ (217)m		1	1			1		1	
nnual totals pace heating fuel used, main system 1 //ater heating fuel used //ater heating fuel used //ater heating fuel used //ater heating pumps, fans and electric keep-hot //ater heating pump: //ater heating pump: //ater heating pump: //ater heating pumps, fans and electric keep-hot //ater heating pump: //ater heating pumps, fans and electric keep-hot //ater heating fuel used //ater heating fuel use	219)m= 191.7 168.55 176.07 156.65 153.1	137.16	130.12				173.39	186.49		٦
pace heating fuel used. main system 1 /ater heating fuel used /ater h	Amount totals			Tota	ii = Sum(2	<u>-</u>	NA/II- /	_		_
lectricity for pumps, fans and electric keep-hot central heating pump: 30						K	wn/yeai	r		
lectricity for pumps, fans and electric keep-hot central heating pump: cooller with a fan-assisted flue cotal electricity for the above, kWh/year lectricity for lighting lectricity generated by PVs cotal delivered energy for all uses (211)(221) + (231) + (232)(237b) = The sum of (230a)(230g) = 75									1926 42	╡
Coolier with a fan-assisted flue Coolier with a	· ·	ot							1020.12	
boiler with a fan-assisted flue otal electricity for the above, kWh/year sum of (230a)(230g) = 75 (231) lectricity for lighting lectricity generated by PVs otal delivered energy for all uses (211)(221) + (231) + (232)(237b) = 10a. Fuel costs - individual heating systems: Fuel kWh/year kWh/year Fuel Price (Table 12) fuel Cost £/year pace heating - main system 1 (211) × (240)								20	1	(2200
otal electricity for the above, kWh/year sum of (230a)(230g) = 75 (231) lectricity for lighting 357.25 (232) lectricity generated by PVs -1364.85 (233) otal delivered energy for all uses (211)(221) + (231) + (232)(237b) = 3636.19 (338) 10a. Fuel costs - individual heating systems: Fuel kWh/year (Table 12) pace heating - main system 1 (211) x 3.48 x 0.01 = 91.95 (240)] 1	
lectricity for lighting 357.25 (232)					-1 (000-)	(000-)		45		_
lectricity generated by PVs otal delivered energy for all uses (211)(221) + (231) + (232)(237b) = 10a. Fuel costs - individual heating systems: Fuel Fuel Price (Table 12) pace heating - main system 1 (211) x 3.48 v 0.01 = 91.95 (240)				sum	of (230a).	(230g) =			75	=
otal delivered energy for all uses (211)(221) + (231) + (232)(237b) = 3636.19 (338) 10a. Fuel costs - individual heating systems: Fuel Fuel Price (Table 12) £/year pace heating - main system 1 (211) x 3.48 x 0.01 = 91.95 (240)	Electricity for lighting								357.25	(232)
Fuel Fuel Price Fuel Cost & KWh/year (Table 12) pace heating - main system 1 Fuel Fuel Price (Table 12) £/year 211) x 3.48 x 0.01 = 91.95 (240)	Electricity generated by PVs								-1364.85	(233)
Fuel Fuel Price Fuel Cost kWh/year (Table 12) £/year pace heating - main system 1	Total delivered energy for all uses (211)(22	1) + (231)	+ (232).	(237b)	=				3636.19	(338)
pace heating - main system 1 $\frac{\text{kWh/year}}{\text{(211)}}$ $\frac{\text{E/year}}{\text{(240)}}$	10a. Fuel costs - individual heating systems:									
pace heating - main system 1 $\frac{\text{kWh/year}}{\text{(211)}}$ $\frac{\text{E/year}}{\text{(240)}}$		Fu	el			Fuel P	rice		Fuel Cost	
3.40 S.40 S.40 S.40 S.40 S.40 S.40 S.40 S										
pace heating - main system 2 (213) \times $0.01 = 0.00$	Space heating - main system 1	(21	1) x			3.4	18	x 0.01 =	91.95	(240)
	Space heating - main system 2	(213	3) x					x 0.01 =	0	(241)

Space heating - secondary	(215) x	13.19 x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	3.48 x 0.01 =	67.04 (247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	9.89 (249)
(if off-peak tariff, list each of (230a) to (230g)			
Energy for lighting	(232)	13.19 X 0.01 =	47.12 (200)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 x 0.01 =	-180.02 (252)
Appendix Q items: repeat lines (253) and (254	•		
	(247) + (250)(254) =		155.98 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255)	$x (256)] \div [(4) + 45.0] =$		0.56 (257)
SAP rating (Section 12)			92.22 (258)
12a. CO2 emissions – Individual heating sys	tems including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	570.75 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	416.11 (264)
Space and water heating	(261) + (262) + (263) + (2	264) =	986.86 (265)
Electricity for pumps, fans and electric keep-h	ot (231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	185.41 (268)
Energy saving/generation technologies Item 1		0.519 =	-708.36 (269)
Total CO2, kg/year		sum of (265)(271) =	502.84 (272)
CO2 emissions per m ²		(272) ÷ (4) =	6.94 (273)
El rating (section 14)			94 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22	3223.69 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22 =	2350.24 (264)
Space and water heating	(261) + (262) + (263) + (2	264) =	5573.93 (265)
Electricity for pumps, fans and electric keep-h	ot (231) x	3.07	230.25 (267)
Electricity for lighting	(232) x	0 =	1096.75 (268)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 29 November 2022

Property Details: Plot 34

Dwelling type: Semi-detached House

Located in:EnglandRegion:East Anglia

Cross ventilation possible:YesNumber of storeys:2Front of dwelling faces:West

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Low

Night ventilation: False

Blinds, curtains, shutters:

Ventilation rate during hot weather (ach):

Dark-coloured curtain or roller blind
3 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient: 172.26 (P1)

Transmission heat loss coefficient: 49.2

Summer heat loss coefficient: 221.48 (P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
West (W_1)	0	1
West (W_2)	0	1
North (W_3)	0	1
East (W_4)	0	1
North (W_5)	0	1
East (W_6)	0	1
East (W_7)	0	1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
West (W_1)	0.85	0.9	1	0.76	(P8)
West (W_2)	0.85	0.9	1	0.76	(P8)
North (W_3)	0.85	0.9	1	0.76	(P8)
East (W_4)	0.85	0.9	1	0.76	(P8)
North (W_5)	0.85	0.9	1	0.76	(P8)
East (W_6)	0.85	0.9	1	0.76	(P8)
East (W_7)	0.85	0.9	1	0.76	(P8)

Solar gains:

Orientation		Area	Flux	g_	FF	Shading	Gains
West (W_1)	0.9 x	1.17	119.47	0.63	0.7	0.76	42.44
West (W_2)	0.9 x	1.12	119.47	0.63	0.7	0.76	40.63
North (W_3)	0.9 x	0.39	82.12	0.63	0.7	0.76	9.72
East (W_4)	0.9 x	2.98	119.47	0.63	0.7	0.76	108.1
North (W_5)	0.9 x	0.39	82.12	0.63	0.7	0.76	9.72
East (W_6)	0.9 x	1.14	119.47	0.63	0.7	0.76	41.35
East (W_7)	0.9 x	1.25	119.47	0.63	0.7	0.76	45.34
						Total	207.22 (P3/P

Internal gains:

	June	July	August
Internal gains	407.07	390.59	398.89
Total summer gains	722.74	687.9	655.48 (P5)

SAP 2012 Overheating Assessment

Likelihood of high internal temperature	Not significant	Medium	Sliaht	
Threshold temperature	19.96	22.01	21.86	(P7)
Thermal mass temperature increment	1.3	1.3	1.3	
Mean summer external temperature (East Anglia)	15.4	17.6	17.6	
Summer gain/loss ratio	3.26	3.11	2.96	(P6)

Assessment of likelihood of high internal temperature: <u>Medium</u>